

ALCOHOL, AND ITS HEREDITARY EFFECTS.

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I HAVE the honour, this evening, to deliver the first of the series of lectures provided by the Manchester and Salford Sanitary Association for the forthcoming winter. The object of the series is to spread, as far as possible, amongst the people some knowledge of the conditions under which health can be secured and maintained, of the ways in which disease is caused and fostered, and of the means by which disease may be prevented.

That a large proportion of the cases of disease which the medical man is called upon to treat can be easily prevented there is no doubt. Of this I am frequently reminded in the course of my work at the Dispensary for Sick Children with which I am connected. More than half the cases I saw there this morning were those of derangement caused by improper food or improper clothing. A little knowledge on the part of the parents would have prevented those disorders entirely.

But among all kinds of preventable diseases, those produced by intemperance in the use of alcoholic drinks hold a pre-eminent place. No agent is known which is so destructive to human life as this. People are dying every day poisoned by it. The actual mortality cannot be ascertained from any known returns, but various estimates have been given by those who have specially studied the subject. Dr. Hardwicke, the coroner for Central Middlesex, whose field of observation is very large, places the yearly mortality from alcohol as high as 100,000. But however large the number of deaths may be, they would represent but a small portion of the evils produced by intemperance; for where one

death is produced, there would no doubt be many cases of disease, of misery, and degradation. And worst of all, the evils brought about by intemperance do not cease with the destruction or degradation of the drinker, but are carried on to his children and his children's children unto the third or fourth generation.

I will first make some remarks upon the forms in which alcohol is generally used, and then speak of its effects upon the human body under various conditions. Alcohol is the principal intoxicating agent of spirits, wine, and beer. In spirits it is present in a very concentrated form, the degree of concentration varying a good deal in the different kinds. In wine and beer it is in a much less concentrated condition. Speaking roughly, brandy, gin, whisky may be said to contain about 50 per cent by volume, or half their bulk of alcohol; strong wine, 20 per cent, or one-fifth of its volume of alcohol; and beer, about 5 per cent, or one-twentieth of its bulk of alcohol.

Alcohol, when swallowed, passes into the stomach. There, owing to its high power of diffusion, it passes rapidly into the blood-vessels, and is thence distributed over the body. Its precise destination, however, has not yet been discovered by physiologists. Nor is anything certainly known about the way it is disposed of in the body. Some of it appears in the breath, to which it imparts the characteristic odour. A small portion transudes through the skin, and appears in the perspiration. When very large quantities of alcohol have been taken small portions of it may be detected in the urine. But only an inconsiderable fraction of the alcohol imbibed can be accounted for in the excretions just mentioned. The great bulk of it appears to be broken up in the system, but in a way which is not yet known.

Now, there are some effects of alcohol which I will call your attention to. You know it is generally called a stimulant. This term correctly describes its action on the heart of a healthy person. It makes the heart beat more forcibly, and at the same time more rapidly, than it would otherwise do. Intimately associated with the effect on the heart is the effect on the blood-vessels. The vessels are rendered fuller than natural. This result is brought about in the following way. The vessels which carry away blood from the heart are called arteries. Now the bore of the vessels depends upon the tightness or the tension, as it is called, of their walls; and the tightness of the walls is regulated by nerves called the sympathetic nerves. Alcohol paralyses the sympathetic nerves, and by so doing relaxes the walls of the arteries. When the wall

is relaxed the vessels dilate, or become fuller of blood. This dilatation causes redness of the skin, and in those who habitually indulge in drink the vessels of the face are in a state of permanent turgescence, which gives rise to the characteristic red tint.

But in some diseases its effects on the heart are quite different from those in health.

In many cases of fever, when the pulse becomes exceedingly rapid and weak, alcohol acts in a most beneficial way, causing the heart to beat more calmly, and at the same time increasing the power of its stroke.

In some cases of heart disease it likewise reduces the frequency, whilst at the same time it increases the force of the heart's beat. For these reasons alcohol is a powerful instrument in the hands of the doctor. It is a powerful drug, and like other powerful drugs it should not be taken except under medical advice, with proper directions as to the quantity and frequency of the dose.

For its action on the heart, alcohol is rightly called a stimulant. But it cannot be called a stimulant in any other respect. In its other actions it is a *narcotic*, and not a stimulant. For instance, by a stimulant to the nerves of sense, we should understand some agent which would render them more keen to receive external impressions. Alcohol does not do this. On the contrary it deadens the sensibility of the nerves. I will give some illustrations of the way in which the various senses are impaired by its use. Take the sense of sight. A sportsman who takes alcohol at his lunch cannot shoot so accurately after the meal as he could before it. Take the sense of hearing and of touch. A musician, nervous about appearing before a large public audience, may take some alcoholic drink to give himself courage. His nervousness is taken away, but at the same time his touch loses its exquisite delicacy.

There is evidence to show that all the other senses are impaired in a similar manner by alcohol. It is true there are some exceptions to the rule, but even these are more apparent than real. For instance, in some cases it appears to cause increased rapidity of thought, and to excite the imagination. But even here the control over a train of thought is lessened. A writer may compose more quickly after drinking alcohol, but his writing will not bear his own criticism the next day.

Another property of alcohol I should like to call your attention to is its effect upon the heat of the body. Its effect is to cool the temperature of the body. This has been established by the researches of Dr. Ringer. The property of alcohol renders it

useful to the doctor in certain cases of fever, where the bodily heat may be excessively high. In some cases beneficial results are obtained from its use. But a great many people take spirits to keep out the cold, as they say. Raw spirits, you see, must tend to make the body colder. When mixed with hot water the mixture warms the body, it is true; but here the active agent in warming is the water, and not the spirit.

The next point I wish to bring before you is that there is evidence that alcohol is being very largely consumed in poisonous doses. To determine the least quantity of alcohol which will produce injurious effects, or the largest quantity which may be taken without doing harm, is a matter of great difficulty.

But the investigation of the question was undertaken independently by two very able observers, Drs. Parkes and Anstie, and the conclusions were in substantial agreement. Dr. Parkes experimented on a healthy man, accustomed to take alcohol in moderation. He came to this conclusion, that $1\frac{1}{2}$ oz. of alcohol in the day was as much as could be taken without harm, and that when this limit was exceeded injurious symptoms became manifest. For women, he placed the limit considerably lower. For children, such a very small quantity of alcohol is sufficient to produce symptoms of intoxication that all medical men are agreed that no alcohol should be given to healthy children.

The equivalent of $1\frac{1}{2}$ oz. of alcohol would be about 3 oz. in brandy, and in beer about a pint and a half. These quantities cannot be exceeded by a strong man without producing symptoms unmistakably poisonous.

This allowance, one would have thought, would have sufficed for most persons; nevertheless, there was clear and conclusive evidence that it was greatly exceeded by vast numbers of people.

Some exceedingly suggestive calculations on the subject have been made by Mr. Whyte, of Manchester, and read at the Social Science Congress recently held there. He made the calculation in this way—the quantities of the liquors consumed in the country, and the proportion of alcohol they contained, were ascertained through the returns of the Excise office. The population of England was reckoned at 24,000,000. Of these he excluded 10,000,000, as non-consumers, including abstainers and children. Deducting these, 14,000,000 were left as consumers. For these, he found that the average quantity of alcohol consumed exceeded $2\frac{1}{4}$ oz. per day. The average is considerably above that allowed by Drs. Parkes and Anstie as the limit for a healthy man.

accustomed to its use. It was also greatly in excess of the limit allowed to women. Now, as some people drink considerably less than $2\frac{1}{4}$ oz. a day, others must drink a great deal more. It was therefore clear that alcohol was consumed daily in poisonous doses by vast numbers of people.

When alcohol is taken in large quantities for a considerable time, it produces in the various organs of the body changes well known to medical men. In the stomach a chronic inflammation is excited. The surface of that organ becomes abundantly coated with mucus. The mucus sets up unhealthy fermentation in the food, which gives rise to the symptoms of indigestion, so often complained of by drinkers. After a time, a marked alteration in the structure of the stomach becomes noticeable. The products of the inflammation press upon the glands, which stud in myriads the mucus membrane of the organ. The glands begin to waste, and after a time the stomach, losing its natural consistence, becomes tough and leathery.

Taken up by the blood-vessels of the stomach, alcohol is carried on to the liver. The effects here, owing to the peculiar structure of this organ, are very striking. The organ consists of small cells grouped in clusters, called lobules. The lobules are held together by a substance called connective tissue. Alcohol causes this to inflame, and the effect of the inflammation is, first, swelling, and subsequently, shrinking of the tissue. The squeezing of the lobules by the shrinking of the connective tissue gives a peculiar appearance to the liver, known as the "hobnail" condition.

In the blood-vessels the influence of alcohol is recognised. A degenerative change occurs in the coats of the arteries. They lose their elasticity; they become prematurely rigid and tortuous; they become like the arteries of aged worn-out people.

Changes are likewise produced in the lungs. Chronic bronchitis is set up, and the lung substance wastes.

In the kidneys changes are produced analogous to those in the stomach and liver. They shrink and become tough and fibrous, and their proper secreting structures waste. This condition of the kidneys is especially noticeable in those who suffer from gout.

The brain, with its vessels and membranes, suffers early. In some cases the membrane of the brain becomes greatly thickened. Alterations in the structure of the brain substance are more difficult to recognise. The organ is so delicate that satisfactory preparations of it can be made only under favourable circumstances for the microscope. But there were strong reasons for

believing that structural changes would one day be found. Many cases of insanity are produced by alcohol. Most physicians hold that in insanity there is some organic change produced in the surface of the brain. Nevertheless, in many forms of insanity, the change, whatever it might be, has eluded scrutiny.

The changes produced by alcohol on the body generally may be briefly described as degenerative changes. Alcohol, to use Dr. Dickinson's words, is the very "genius of degeneration." It makes the body prematurely old. This result is well known to life insurance societies, and the following table, quoted from "Neison's Vital Statistics," illustrates it forcibly:—

A TEMPERATE PERSON'S CHANCE OF LIVING IS—		AN INTEMPERATE PERSON'S CHANCE OF LIVING IS—	
	Years.		Years.
At 20	44·2	At 20	15·6
„ 30	36·5	„ 30	13·8
„ 40	28·8	„ 40	11·6
„ 50	21·25	„ 50	10·8
„ 60	14·28	„ 60	8·9

We may summarise the principal results of the prolonged use of alcohol in large quantities as follows:—

1. It produces general degenerative changes like those of old age.
2. Special alterations of certain organs of the body, as, for instance in the stomach or liver, may be produced.
3. Gout may be produced.
4. Insanity may be produced.

Now the special question for us to consider this evening is, whether any of these changes are transmitted to the offspring, and if so, in what form they are manifested. The question may be answered decidedly in the affirmative. The changes induced by alcohol are certainly impressed upon the offspring, and are manifested in a defective bodily structure and in certain depraved instincts.

We can illustrate this assertion by some facts observed in the breeding of animals. Much light has been thrown on the hereditary transmission of disease in this way. Amongst individual animals born of the same parents there are numerous varieties. By suitable pairing the breeder may reproduce certain qualities, which he may value in the individual. In the next generation he again picks out the individuals which possess the desired qualities, in, perhaps, a still more marked degree, and pairs them; and so he goes on, until he perpetuates a breed with the qualities he wishes to obtain.

The following striking example is given by Professor Huxley:—

A farmer in Massachusetts possessed a flock of 15 ewes and a ram of the ordinary kind. In the year 1791 one of the ewes presented her owner with a male lamb, differing from the parents by a proportionally long body and short bandy legs, hence it was unable to emulate its relatives in those sportive leaps over the neighbouring fences in which they were in the habit of indulging, much to the good farmer's vexation. His neighbours imagined that it would be an excellent thing if all his sheep were endued with the stay-at-home tendencies enforced by nature upon the newly-arrived lamb, and they advised Wright to kill the old patriarch of his fold, instal the "other," or ancon ram in his place. The result justified the sagacious anticipations. Young lambs were almost always pure ancon or pure ordinary sheep, and when sufficient ancon sheep were obtained to inter-breed with one another, it was found that the offspring was always pure ancon. In this instance, well authenticated, we have a distinct race established at once by a leap, and that race breeding true. When the ancon sheep were herded with other sheep they kept together, so that it was believed that the breed might have been indefinitely protracted had it not been superseded by the introduction of the merino sheep, which were not only superior to the ancon in wool and meat, but were equally quiet and orderly.

I will now quote a parallel case from the human family.

Those who see large numbers of children often come across an individual with an additional finger on each hand, and an additional toe on each foot. This peculiarity may sometimes be transmitted through several generations. Thus Professor Huxley cites the case of a Maltese couple, who, having hands and feet of the ordinary type, had born to them a son, Gratio, who possessed six perfectly movable fingers on each hand, and six toes, not quite so well formed, on each foot. The son married a woman with the ordinary number of fingers and toes, and of their children one had six fingers and six toes, but the others were of the normal type. The six-fingered son had three out of his four children six-fingered. But what is more remarkable, two of Gratio's children, of the normal type, having married five-fingered wives or husbands, nevertheless reproduced in the next generation the six-fingered type. Thus, although in each case one parent and sometimes both were five-fingered, the six-fingered variety persisted down to the grandchildren of Gratio.

We have likewise striking proofs from the animal kingdom

that newly-acquired habits and instincts of one generation are transmitted by inheritance to the next. I will quote two striking instances given by Lyell.

Some Englishmen, engaged in mining work in Mexico, carried with them some English greyhounds of the best breed to hunt the hares which abound in that country. The great platform which was the scene of sport is 9,000 feet above the level of the sea. The atmosphere there is of course very attenuated, and it was found that the greyhounds could not support the fatigues of the chase in it. Before they could come up with their prey they had to lie down gasping for breath. Nevertheless, the animals have produced whelps which have grown up not in the least degree incommoded by the rarity of the atmosphere, and which run down hares with the same ease as the fleetest of their race do in this country.

The inherited instinct of the retriever is very curious. This race of dogs brings back game of its own accord. A French observer procured a pair, and having obtained a whelp from them kept it constantly under his eye, so that he was sure that it received no instruction. On the very first day that it was carried to the chase it brought back game with as much steadiness as dogs which had been schooled into the same manœuvre by whip and collar.

To explain the way in which these peculiarities of body and of habit are transmitted to the offspring, I will briefly refer you to some simple anatomical facts. Let us examine into the development of the chick. Take an egg of the common fowl at the commencement of hatching and break it open. You will see at the top of the yolk a small transparent area, only half the breadth of your finger nail. This small area has a wonderful future before it. It changes, step by step, into the highly complex body of the chick, and absorbs into itself all the white and yolk of the egg. The area I have just mentioned is made up of minute particles called cells, so small that you must use a powerful microscope in order to see them. These cells are at first arranged in two layers. Soon afterwards a middle layer of cells makes its appearance between the two original layers. Each of these layers plays an important part in the subsequent development of the chick. The skin, the brain, and spinal cord is formed out of the upper layers; the mouth, stomach, intestines, liver, lungs, out of the lower layer; and the muscles and bones out of the middle layer.

Speaking briefly, the brain and spinal cord are formed as follows. At a very early period the upper layer is raised up into two

ridges or folds, which run parallel to each other and form a groove. The ridges increase in height, then they bend over towards each other, and eventually meet and coalesce. Thus a canal is formed. In this canal the spinal cord develops. The front end of the canal becomes expanded, and out of the expanded portion the brain is formed.

It is not until the sixth day of the hatching that the embryo of the chick takes on any of the characteristics peculiar to a bird. Previously to that day no one could say from examination of the embryo whether it would develop into a bird, a dog, or even a human being. In the first days of development the embryo of all vertebrate animals are alike.

There are many gaps in our knowledge of development which have as yet to be filled up by speculation. A theory has been given to account for the transmission to the offspring of the parents' characters. This theory asserts that minute particles or germs are brought from all parts of the bodies of both parents, and deposited in the ovum or egg out of which the young animal is formed. Thus every organ of both parents is represented in the small compass of the ovum. Germs from the brain, the liver, the lungs, and from all other organs and parts of the body are present there.

It is evident that these germs must be bodies of marvellous power. It is evident that they must be derived from perfectly healthy organs, in order that the young animal which they will eventually form may attain its due development. It is evident also that if any of these germs are derived from unhealthy organs, the development of the young animal will be seriously risked.

We are now in a position to explain more clearly how the offspring of intemperate persons suffers through the vices of their parents. Alcohol, as we have shown, tends to cause degeneration in all the organs of the body, and every organ of the bodies of both parents is represented in the embryo. The latter must, therefore, be formed out of unhealthy germs, and out of unhealthy germs unhealthy organs must be expected to grow. It might, therefore, be anticipated that the offspring would exhibit signs of imperfect development in certain organs of the body, or in the body generally. Observation shows that this actually takes place. Sometimes there is a general want of development, so that the offspring exhibits a remarkably stunted growth. Sometimes the effects are expressed in one organ more than another. But of all organs the brain is the most liable to suffer, and with the

most deplorable consequences. An arrest in the development of the brain meant idiocy. Of this all degrees were found. Sometimes the idiot might be unable to stand, unable to express a want, leading simply the life of a vegetable. Sometimes the animal faculties might be well developed, but the moral sense entirely or partially wanting. This class furnished a large contingent to our prisons. Their type of face was well known. Their reformation was almost hopeless.

The only attempt, as far as I know, to express in numbers the relation between intemperance and idiocy, was made by Dr. Howe, in his report to the State of Massachusetts, in the year 1848. Out of 359 idiots he examined, he found that 99 were the children of drunkards. But this, he tells us, does not express the whole truth. By a drunkard is meant a notorious drinker. But many, who are habitually intemperate, do not get that name. By inquiring carefully into the number of idiots whose parents were known to be temperate, he found that not one quarter of them could be so considered.

The following genealogy of alcoholic disease is given by the French writer Morel. The ancestor was a drunkard. In the first generation there was excessive drinking and immorality. In the second, hereditary drunkenness, attacks of madness, and general paralysis. In the third generation, hypochondriasis and immoral tendencies. In the fourth, feeble intelligence and idiocy. Here the race became extinct.

The effects, then, upon the offspring of intemperance in the parents may be summarised as follows:—

1. They may be expressed generally in a stunted growth.
2. They may be expressed in various abnormal conditions of the brain, arising from arrested or perverted development. These are idiocy, the criminal type, the various insane types of brain.

Such were the undoubted effects produced upon the offspring by the intemperate use of alcohol.

There is yet another question for us to answer. Are any ill effects produced upon the race by the more moderate use of alcohol? The question is answered in the negative by Sir James Paget. His argument is this: The nations of Europe use alcohol freely; the nations of Asia, as a rule, do not. But the nations of Europe are nobler and more energetic than those of Asia. It is true, he admits, that nations who use alcohol may not be so long-lived as those who abstain. But energy and enterprise are of more value than mere longevity.

On the whole he is convinced that the moderate use of alcohol does good rather than harm to the race. On this point, of course, there are great differences of opinion. All that can be said is, that there is no proof that the moderate use of alcohol has done harm to the race.

But the still prevalent use of alcohol in greater or less moderation amongst Englishmen, indicates rather a strongly marked inherited taste for the liquor than its admitted usefulness. The English and the Germans use alcohol more freely than any other race on the face of the earth. The English came and settled in this country some fourteen hundred years ago. Before that time they lived in the forests of Germany. Now we possess an account of the habits of the old German races from the pen of the Roman historian, Tacitus, who lived at the end of the first century. He describes the national features, the blue eyes, the red or sandy hair, and the muscular frames; the sanctity of the marriage tie among them, the chastity of the female sex, and the respect paid to them. Then he describes their inveterate love of drinking. Their favourite drink then, as now, was beer. They could not consult without a convivial meeting. If they quarrelled over their cups, they had recourse rarely to words, usually to blows.

When our forefathers came to England they brought with them the old habits they had contracted in the forests of Germany; and when centuries afterwards they went forth—they went forth from this country to colonise all parts of the world—they carried with them the same habits.

Deep rooted, however, as the taste for alcohol is in Englishmen, there are signs that a change has been surely and silently working amongst them. The change has been most marked in the middle classes of society. Only a generation or two back it was impossible for people in comfortable circumstances to meet together without consuming an excessive amount of alcoholic drink. Such behaviour would not be tolerated in these days.

There is now a general tendency to the more restricted use of alcohol. It is daily being proved that most men and women can enjoy as good health without it as with it. It used to be thought that alcohol was necessary for the soldier to support his flagging strength under the fatigues of the march. Yet actual observation has shown that the soldier bears those fatigues, even when exposed to the extremes of heat or cold, better without alcohol than with it. Actual observation has shown that coffee or beef-tea were far superior to alcohol under those conditions. The famous

siege of Gibraltar had shown the advantages of rigid temperance to the soldier subjected to great privations. The practice of the experienced Swiss guides was worthy of note. They allowed the use of very light wine, or else of no wine at all, when taking travellers across the glaciers. The hardest mental work likewise can be done as well without alcohol as with it, and this is shown by numberless instances.

Amongst the labouring classes, however, the hold of alcohol remains very fast. Thousands of them, when their wages increase, have no other way of enjoying themselves than by spending their money in drink. Some would see no remedy for the evil except in some stern repressive measures carried out by the State. Let us have patience. The influences which have wrought so great a change in the middle classes will gradually penetrate to the poorer ones. As their homes become more healthy, as the value of various kinds of food becomes better known, and better methods of preparing it practised, as more places for rational enjoyment are opened out, the temptation to drown the cares of life in drink must become less and less. We look forward to the time when sobriety and self-control will become the rule, with only a few exceptions here and there. When this time arrives a large mass of disease will have ceased to exist, and future generations will no longer number the hereditary effects of intemperance among the ills to which they are heirs.



